

artificially at Lafayette, he was unable to get any seed. *H. Dalyi*, according to FARWELL, is a variety of *H. Maximiliani*, related to it much as var. *oppositifolius* Farwell is related to *H. giganteus*. An effort should be made, however, to raise a *giganteus*×*Maximiliani* hybrid. *H. ambiguus* (Gray) Britton is supposed to be a hybrid *giganteus*×*divaricatus*, or at any rate to have *giganteus* as one parent. THELLUNG records a garden hybrid *laetiflorus*×*rigidus*, and the plant called *H. serotinus* Tausch (1828) is supposed to be *strumosus*×*rigidus*. Evidently there is a great deal to be done, both in the field and in the garden, before we can reach a fairly clear understanding of this subject. It seems possible that in this genus the origin, through hybridization, of distinct plants, with the attributes of species, may be demonstrated.—T. D. A. COCKERELL, *University of Colorado, Boulder, Colo.*

RELATIONSHIPS WITHIN THE RHODOSPOREAE

During the last 15 or 20 years the author has studied the structure of 30 to 40 species of *Pluteus* and 4 or 5 species of *Volvaria*. In all of these species, without a single exception, the trama of the lamellae presents a curious and interesting structure. In the majority of the Agaricaceae, the trama hyphae of the lamellae lie, in general, in a parallel direction, as in *Mycena*, *Tricholoma*, *Collybia*, *Inocybe*, *Entoloma*, *Leptonia*, etc. In *Russula* and *Lactarius* many of the cells are so swollen that the trama of the lamellae presents a vesiculose appearance. In *Amanita* the hyphae show a strong divergence from the median plane toward the subhymenium as they descend in the trama.

In *Pluteus* and *Volvaria*, on the other hand, the most prominent hyphae *converge* as they descend in the trama of the lamellae. Along the median plane of the lamella there can usually be seen, in section, a layer of hyphae (sometimes more slender) against which these prominent cells converge. Attention was called to this peculiar structure in *Pluteus seticeps* in 1902,² but no interpretation was offered as to its origin or significance.

During the summer of 1917, Professor LEVA B. WALKER, of the University of Nebraska, while studying the development of *Pluteus*

² See *Leptonia seticeps* Atkinson, Jour. Myc. 8:116. 1902. Further collections and studies of this species show that it is a *Pluteus*. While the gills are attached to the stem before the expansion of the plant, they become free, rounded behind, and distant from the stipe. The stipe also easily separates from the pileus, and other structural characters are clearly those of *Pluteus*. It is therefore *Pluteus seticeps* Atkinson, ined.

admirabilis Pk., in this laboratory, discovered the origin of this structure. These prominent hyphae are long, stout, subcylindrical cells, which arise from the inner cells of the subhymenium and extend downward, converging by their free ends against the trama, often compressing it into a thin layer. In some species the free ends of these cells are subcapitate, with a slight constriction below the capitulum. It is clear, therefore, that these peculiar structures in the trama of the lamellae of *Pluteus* and *Volvaria* are internal cystidia of a special kind. They are different in form from the other types of cystidia which project outward beyond the surface of the hymenium in many species. The origin and development of these internal cystidia will be described by Professor WALKER in a forthcoming paper on the development of *Pluteus admirabilis*.

The presence of these numerous internal cystidia, giving a distinct structural aspect to the trama of the lamellae in *Pluteus* and *Volvaria*, indicates that there is a very close phylogenetic relation between these two genera. In both genera the stipe is separable from the pileus, and the spores are of the same type, being smooth, globose, or slightly elongated. No true species of *Annularia* have been examined in the fresh condition to determine whether or not internal cystidia are present. It cannot now be stated with confidence to which group it belongs, but other morphological features indicate that it is more closely allied to *Pluteus* and *Volvaria*. In the other genera of the Rhodosporeae the stipe is not separable from the pileus, the spores are angular, and these peculiar internal cystidia are absent.

In the Rhodosporeae, therefore, there are at least two distinct phyletic lines. The relation of the genera to these two phyletic lines may be represented as follows.

I. PLUTEINAE.—Pileus easily separable from the stipe; lamellae with numerous internal cystidia converging as they descend and sometimes nearly obliterating the trama by pressure; spores smooth. *Pluteus* and *Volvaria* (?*Annularia*).

II. ENTOLOMATINAE.—Pileus not separable from the stipe; lamellae without numerous internal cystidia, trama normal; spores angular. *Entoloma*, *Leptonia*, *Clitopilus*, *Eccilia*, *Nolanea*, and *Claudopus*.—GEO. F. ATKINSON³

³ This paper was received from the late Professor ATKINSON in January 1918.